

Claims

1. A magnetic signature minesweeping device comprising:

- a water driven turbine power generator and
- a superconducting material magnet,

wherein the turbine power generator is arranged, in use, to supply a driving current for the superconducting material magnet when the minesweeping device is towed through the water.

2. A device as claimed in claim 1, wherein the minesweeping device comprises a control unit arranged, in use, to control the magnetic output of the superconducting magnet and the power output of the turbine power generator.

3. A device as claimed in claims 1 or 2, wherein the minesweeping device comprises a plurality of sensor units arranged, in use, to monitor the magnetic output of the superconducting magnet, and the power output of the turbine power generator, and further comprises a feedback arrangement to supply feedback signals from the sensor units to the control unit, whereby the magnetic output and power output can be optimised for a specific mine countermeasure task.

4. A device as claimed in any one of the preceding claims, wherein the turbine power generator comprises adjustable pitch blades, whereby drag characteristics of the turbine power generator are adjustable.

5. A device as claimed in any one of the preceding claims, wherein the superconducting material magnet is disposed as a single axis longitudinal magnetic source or as a three-axis magnetic source.

6. A device as claimed in any one of the preceding claims, wherein the minesweeping device further comprises a communications unit arranged, in use, to enable remote access to the control unit.

7. A device as claimed in claim 6, wherein the communications unit comprises at least one of a group comprising acoustic, radio, induction or cable format communication devices.

8. A device as claimed in any one of the preceding claims, wherein the superconducting material magnet comprises a high T_C superconductor.
9. A device as claimed in claim 8, wherein the superconducting material magnet is operable at liquid nitrogen temperatures.
10. A device as claimed in claim 8 or claim 9 wherein the superconducting material magnet is selected from a group of materials including multi-filamentary composite wire BSCCO-2223 ($\text{Bi}_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10+\delta}$) and a coated conductive composite incorporating YBCO($\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$).
11. A device as claimed in any one of the preceding claims, wherein the superconducting material magnet is arranged such that, in use, it exhibits a permanent magnetic output component and a variable magnetic output component for representing the permanent and induced components of a vessel's magnetic signature.
12. A device as claimed in any one of the preceding claims, wherein the control unit is arranged, in use, such that the magnetic output is variable as a function of time and/or position, for facilitating the generation of desired magnetic signatures for simulating vessels, the device including at least one position sensor to which the control unit is responsive.
13. A device as claimed in any one of the preceding claims, wherein the device is a magnetic signature device operable in target emulation mode (TEM), wherein it emulates the magnetic signature of a particular vessel.
14. A device as claimed in any one of the preceding claims wherein the device is operable in mine setting mode (MSM), and is programmed to produce a magnetic signature associated with a particular type of mine for triggering said mine.
15. A device as claimed in any one of the preceding claims, wherein the minesweeping device comprises an interface unit for interfacing to one or more other minesweeping devices, wherein the interface unit comprises an electrical output for power "take-off" from the turbine power generator to the other minesweeping devices.
16. A device as claimed in claim 15, wherein the interface unit is arranged such that, in use, the power take-off is facilitated via a tow and power cable connection to the other minesweeping device.

17. A device as claimed in claims 15 or 16, wherein the other minesweeping devices comprise further superconducting material magnets.

18. A device as claimed in any one of claims 15 to 17, wherein the interface unit further comprises a control interface, whereby the control unit of the minesweeping device is capable of controlling the magnetic output of the other minesweeping devices.

19. A device as claimed in any one of the preceding claims, wherein the turbine power generator and the superconducting material magnet are implemented as separate elements arranged, in use, to be connected via a tow and power cable.

20. A method of magnetic signature minesweeping utilising a water driven turbine power generator and a superconducting material magnet, wherein the turbine power generator supplies a driving current for the superconducting material magnet when the minesweeping device is towed through the water.

21. A method as claimed in claim 20, wherein the method comprises controlling the magnetic output of the superconducting magnet, and the power output of the turbine power generator.

22. A method as claimed in claims 20 or 21, wherein the method further comprises monitoring the magnetic output of the superconducting magnet and the power output of the turbine power generator, and supplying feedback signals for the controlling of the magnetic output and the power output, whereby the magnetic output and power output can be optimised for a specific mine countermeasure task.

23. A method as claimed in any one of claims 20 to 22, wherein the turbine power generator comprises adjustable pitch blades, whereby drag characteristics of the turbine power generator are adjustable.

24. A method as claimed in any one of claims 20 to 22, wherein the superconducting material magnet is disposed as a single axis longitudinal magnetic source or as a three-axis magnetic source.

25. A method as claimed in any one of claims 20 to 24 including arranging the superconducting material magnet such that, in use, it exhibits a permanent magnetic output component and a variable magnetic output component for representing the permanent and induced components of a vessel's magnetic signature.

26. A method as claimed in any one of claims 20 to 25, wherein the method further comprises varying the magnetic output as a function of time and/or position, for facilitating generating desired magnetic signatures for simulating vessels.

27. A method as claimed in any one of claims 20 to 26, wherein the method further comprises the step of interfacing to one or more other minesweeping devices, wherein the interfacing comprises an electrical output for power "take-off" from the turbine power generator to the other minesweeping devices.

28. A method as claimed in claim 27, wherein the other minesweeping devices comprise further superconducting material magnets.

29. A method as claimed in claims 27 or 28, wherein the method further comprises controlling the magnetic output of the other minesweeping devices.

30. A magnetic signature minesweeping arrangement comprising an array of minesweeping devices configured to be towed in a serial array, each of the minesweeping devices including a superconducting material magnet, and at least one of the minesweeping devices including a water driven turbine power generator arranged, in use, to power at least one of the minesweeping devices.

31. A magnetic signature minesweeping device substantially as herein described with reference to the accompanying drawings.

32. A method of magnetic signature minesweeping substantially as herein described with reference to the accompanying drawings.

33. A magnetic signature minesweeping arrangement substantially as herein described and illustrated.